



KMV innerVision

X-Ray Vision for the Production Line™

Installation & User Guide

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User Responsibility

The following general safety precautions must be observed during all phases of operation of the innerVision x-ray vision system. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the system. KMV assumes no liability for the customer's failure to comply with these requirements.

Safety Information

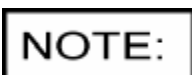
Specific notations are used in this manual to call attention to conditions that could potentially result in personnel injury, damage to equipment, or a condition which if not strictly observed, could result in injury or loss of life.



A **WARNING** notation is used to describe an operating or maintenance procedure, practice, or condition which if not strictly observed could result in injury or loss of life.



A **CAUTION** notation is used to describe an operating or maintenance procedure, practice, or condition which if not strictly observed could result in damage or destruction of equipment.



A **NOTE:** notation is used to describe a general rule for a procedure or an exception that requires the attention of the operator.



To ensure personal safety, it is necessary that a radiation meter be used to check for radiation leakage during installation and periodically thereafter (not to exceed six months). The radiation survey instrument shall be calibrated at intervals specified by your Local Governing Authority. This instrument should be sufficient and suitable for detecting and measuring the types and levels of radiation involved.

NOTE:

Geiger-Muller and certain other scintillator type radiation meters may not be acceptable when checking radiation from x-ray systems.

NOTE:

KMV personnel perform a radiation leakage survey at the time of manufacture of your innerVision x-ray vision system. These persons are competent, but may not be considered qualified experts by your state or country. Check with your state or local radiation control authority to determine what the survey requirements are in your locale. It may be possible that a qualified expert must survey the installation before the equipment is placed into service.



Each user shall keep ALL radiation exposures **AS LOW AS REASONABLY ACHIEVABLE**, complying with the ALARA philosophy. This basically means the user is to keep his fingers and hands out of the radiation beam. The protection of personnel and the public depends almost entirely on strict adherence to safe operating procedures.

NOTE:

Government Regulations

Certain states in the U.S. have radiation control regulations that require registration of radiation sources with proper state and / or local public health agencies. Registration normally must be made immediately or within 30 days of acquiring such a source. Regulations vary in other countries. Please contact your local public health agency for registration information pertinent to this installation.

NOTE:

Operator Safety

The KMV innerVision x-ray vision system should be operated only by personnel who have been instructed in radiation safety and the operating instructions set forth in this manual. Most x-ray installations are subject to Federal, State and Local regulations which may involve registration, licensing or compliance with specific rules. The KMV innerVision x-ray vision system requires a primary radiation barrier and other shielding material to protect the operator from the radiation beam.

The user should perform a survey on the KMV innerVision x-ray vision system before the first use, this survey should be repeated in six month intervals. In addition, KMV recommends the use of a radiation film badge program for cumulative individual monitoring. Contact KMV for information pertaining to Film Badge Programs.



Do Not Operate In an Explosive Atmosphere

Do not operate the KMV innerVision x-ray vision system in the presence of flammable gases, fumes or suspended dust particles. Fire and / or explosions could result due to ignition from electrical arcing.



Do Not Operate In a Wet Environment

To minimize shock hazard, the KMV innerVision x-ray vision system should not be used in a wet or damp environment.



Do Not Substitute Parts or Modify System

Due to the danger of introducing hazards, do not install substitute parts or perform any unauthorized modification to the KMV innerVision x-ray vision system.



Never disconnect the HIGH VOLTAGE CABLE while the AC power is “ON”. The user may receive a severe or lethal electrical shock by doing so.

Hardware Overview

Your innerVision system is manufactured for Plug and Play operation and includes the following items:

1. Emitter
2. Lens Assembly
3. Controller
4. Remote Control Panel
5. Cables
6. Enclosure (optional)

Emitter – The Emitter creates the X-Ray light and focuses the beam onto the product being inspected.



Lens Assembly – The Lens Assembly takes the X-Ray image of the part being inspected and converts it into a visible image. It then processes that image based on user defined inspection paths.



Controller – The Controller supplies all communication and power to the Emitter and Lens Assembly. It also has digital I/O and Ethernet for ease of implementation into your production line.



Remote Control Panel – The Remote Control Panel has two visible x-ray on indicators. The first is a red LED indicator marked “X-Ray On”. The second is the Tube Current (mA) digital readout. Other features of the Remote Control Panel are the Tube Power (kV) digital readout, the On/Off key switch and the Emergency Stop button.



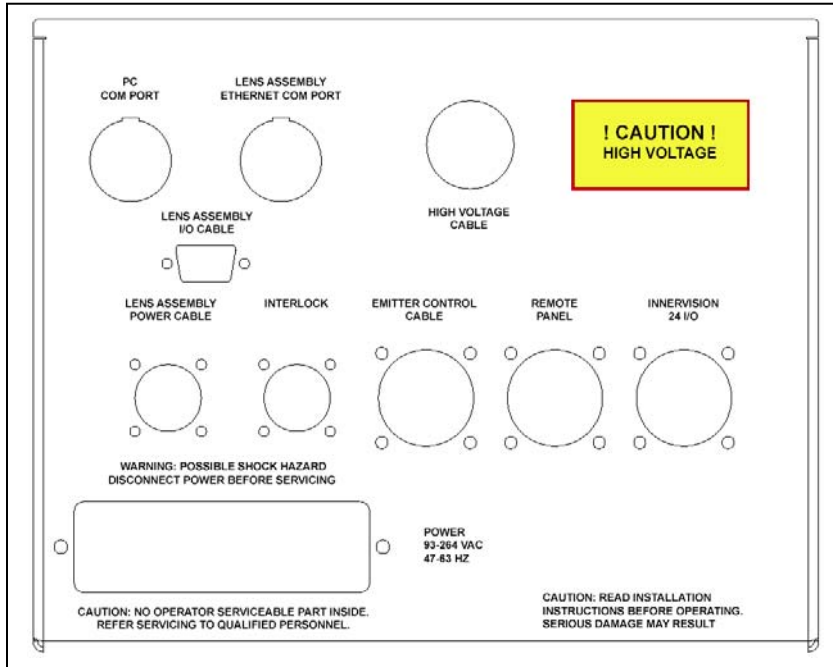
Cables – The Cables are identified by the following part number and description:

<u>P/N</u>	<u>Cable</u>
i6-3-33-001	High Voltage
i6-9-93-001	Lens Assembly Power
i6-9-93-002	Interlock
i6-9-93-003	Emitter Control
i6-9-93-004	Remote Panel
i6-9-93-005	Digital I/O
i6-9-93-006	Lens Assembly I/O
i6-9-93-007	Ethernet

Hardware Setup

In this section, physical connections to the innerVision system are explained. This includes powering up the system and connecting the communication and I/O cables.

Controller Connections



Connect the keyed RJ-45 Lens Assembly I/O Cable (part number i6-9-93-006) to the Lens Assembly. Connect the opposite end of the Lens Assembly I/O cable to the Controller port marked “Lens Assembly I/O Cable”. Connect one of the RJ-45 Ethernet cables (part number: i6-9-93-007) to the Lens Assembly. Connect the opposite end of the Ethernet cable to the Controller port marked “Lens Assembly Ethernet COM Port”.



Connect the Lens Assembly Power Cable (part number: i6-9-93-001) to the Lens Assembly. Connect the opposite end of the Lens Assembly Power Cable to the Controller port marked “Lens Assembly Power Cable”.



Connect the Emitter Control Cable (part number: 9-93-003) to the Emitter. Connect the opposite end of the Emitter Cable to the Controller port marked “Emitter Control Cable”.



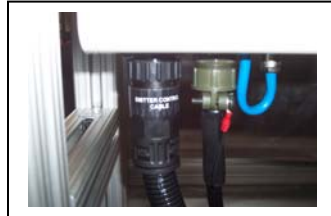
Connect the Remote Panel Cable (part number: 9-93-004) to the Remote Panel. Connect the opposite end of the Remote Panel Cable to the Controller port marked “Remote Panel”.



Connect the Digital I/O Cable (part number: 9-93-005) to the Controller port marked “innerVision 24 I/O”. The free leads on the opposite end of the cable correspond as follows:

<u>Cable pin</u>	<u>Default Headers</u>	<u>Wire color</u>
1	1 trig	Brown
2	2 PSEL	Blue
3	3 I/O 0	Orange
4	4 I/O 1	Yellow
5	5 I/O 2	Violet
6	6 I/O 3	Grey
7	7 Pass	White
8	8 Fail	White/Blue
9	9 USR 1	White/Green
10	10 USR 2	White/Red
11	11 Busy	White/Black
12	12 Imaging	Green
13	V+	Red
14	GND	Black
15	SHLD	Green/Yellow

Connect the High Voltage Cable (part number: 3-33-001) to the Emitter. Connect the opposite end of the High Voltage Cable to the Controller port marked “High Voltage Cable”.



The Safety Interlock Cable (part number: i6-9-93-002) connects to the Controller port marked “Interlock”. The opposite end connects to your safety interlock switches.

The system power is rated for 93 – 264 VAC, 47 – 63 Hz. A three conductor AC power cable is included with your system. Do not power up the system until a proper primary radiation barrier is in place. When powering up please refer to the warm up procedure on page 16.

Communicating with innerVision

Your innerVision system has been pre-loaded with KMV innerVision firmware. A KMV version specific DVT FrameWork software platform is used for image programming. A CD with a copy of the pre-loaded version of KMV innerVision firmware and the corresponding version of DVT software is included with your system.

Your KMV innerVision system uses Ethernet and TCP/IP communication protocol. This section outlines how to establish communications with your innerVision system. In order to communicate with your innerVision system, you will need the following:

1. PC: A Pentium class PC with the following hardware and software:
 - a. Windows® Operating System: Windows 98®, NT, XP, or 2000. (Windows 2000® or a more recent release is recommended.)
2. FrameWork Software: The KMV version specific DVT FrameWork software included on your CD.
3. Ethernet Network Card: 10/100 megabit Ethernet card. For laptop computers, an Ethernet card with CardBus technology and integrated RJ-45 jack is recommended. The Ethernet card's appropriate drivers should be installed and the TCP/IP communications network protocol should be installed and setup.
4. Ethernet Cable: Category 5 Ethernet Cable (straight-through) with RJ-45 connectors. (Note: The RJ-45 connection on your innerVision Controller is designed to communicate between the innerVision system and a PC running the

DVT Framework software included on your CD. To do this, the PC must have an Ethernet network card running the TCP/IP protocol.

The PC and your innerVision system communicate using the TCP/IP networking protocol. All innerVision systems come with default IP addresses for the Controller and Lens Assembly (these may have been changed if your system is being supplied by a machine builder). Your PC's IP address will need to match the IP address scheme of the innerVision Controller and Lens Assembly. If you need to change the IP address scheme of the innerVision Controller and Lens Assembly, please contact KMV.

Please use the following steps to communicate with the innerVision Lens Assembly and innerVision Controller:

Install the KMV version specific DVT Framework software included on the CD that shipped with your system on your PC.

Start the DVT Framework software.

Click and Open the "Network Neighborhood". Network Neighborhood allows you to identify the Lens Assembly. Your PC will search your local network for the Lens Assembly.

Preventive Maintenance

The KMV innerVision x-ray vision system should be maintained on a six-month schedule as follows:

Six Month Maintenance Schedule

Radiation Safety Standard

For systems delivered to the USA:

Less than 0.5 mR/hr at 5 cm (2 in.) from exterior surface at maximum kV and mA settings.

For systems delivered to the UK & Ireland:

Less than 0.1 mR/hr at 10 cm (4 in.) from exterior surface at maximum kV and mA settings.

Measuring Instrument Check - Before Survey

Type of instrument:

The Victoreen 450 P or equivalent with an accurate reading at 0.5 mR/hr is recommended.

Calibration Date:

Make certain that the meter has a current calibration status.

Battery Check:

Check for proper battery condition. Replace the batteries before the survey if required.

Operational Source Check:

If the meter has a source check function, check the meter as described in the meter operator manual.

When using a meter with a beta cap, all measurements should be made with the beta cap removed.

Performing a Radiation Survey

Surveying the innerVision X-Ray Vision System

1. Turn on the system and perform the proper Power-Up and Warm-Up procedure (see Power Up Procedure).
2. Perform an operational check on the survey meter.
3. Place a part that you are currently inspecting in the center of the system between the emitter and lens assembly.
4. Power up the innerVision system and bring the kV and mA up to the full power position.
5. Slowly scan the outer edges of any access panels on the enclosure, paying attention to the areas where the access panel meets the cabinet. Scan the four sides, top and bottom of the enclosure.

Scan at about 4 cm/second (about 1.6 inches/ second) across each surface about 2 to 2.5 cm (.08 to 1 inch) from the face of the surface. Scans are made in horizontal movements from one edge to the other. Move the meter down an average of 5 cm (2")

each pass. Scan in a parallel line back and forth until the whole side is scanned. If there is an increase in the meter reading while scanning, by leakage or by a burst of background radiation an area of approximately 5 cm x 5 cm (2"x2") shall be very slowly scanned. Go over the area two or three times until there is a stabilized reading on the meter. The highest stabilized reading (HR) is recorded for all four sides and for the top and bottom of the system.

6. Determine the lowest value of background radiation, by turning the x-ray system off and waiting for the meter to stabilize to its lowest level (BG). Record this value. Actual (NET) leakage values are determined by the following formula.

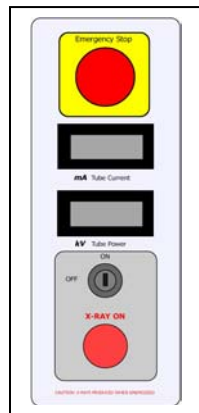
$$\text{Actual Leakage} = \text{HR} - \text{BG}$$



The Radiation Survey should be performed by a competent and qualified individual with training in radiation safety.

Check the X-Ray On indicators.

The innerVision x-ray vision system has two visible x-ray on indicators. The first is a red LED indicator on the remote panel marked "X-Ray On". The second is the mA digital readout on the remote panel.



The E-stop button when activated will open the safety interlock circuit. The mA and Kv settings on the displays will go to 0 and the X-ray On indicator light will turn off. To recover from activating the remote panel e-stop button, make sure the button is in the run state and then turn the key switch to the off position and back to the on position. Your mA and Kv settings will return to normal running values and the X-ray On indicator light will be on.

Ensure that all x-ray on indicators are functioning when x-rays are energized.



If an indicator is found to be defective, **DO NOT OPERATE** the system. Please call KMV for service advice.

Enclosure Access Panel(s) interlocks

(Dependent on your enclosure design)

Enclosure access panel interlocks are used to de-activate the kV and mA settings when the panel is opened, allowing for maintenance and access to the innerVision system while the system is powered up. While the system is in run mode and the access panel interlock is opened, the kV and mA settings will go to zero and the X-ray On indicator light on the remote panel will turn off. To reactivate the system, close the access panel to activate the interlocks and interlock safety circuit. Turn the key switch to the off position and back to the on position. The kV and mA settings will return to the proper run values.

Check the Enclosure Access Panel(s) interlocks.

(Dependent on your enclosure design)

1. Ensure that the enclosure Access Panel(s) is closed and secured.
2. Adjust the kV and mA to the lowest levels.
3. Place the radiation meter near the door, positioned so that the display is visible.
4. Open the door while reading the meter. The meter should not rise above background levels.
5. The opening of the door should terminate the x-ray exposure.
6. Close the door without resetting the x-ray key switch, X-rays should not activate without resetting the x-ray key switch.



If the interlocks are found to be defective DO NOT USE the system, call for service.

Check the kV and mA meters for operation.

Check the kV and mA meters for missing or defective LED elements.

Power up procedure

Verify that all of the cables are plugged in the proper locations (please see the hardware overview section of this manual). Review the power requirements that are on the controller (see the controller section of this manual). Turn on the switch located in the lower left corner of the controller cable panel. Once the switch is on, the displays on the remote panel should read zero for the mA and kV setting. The X-ray On indicator light should be off. You will turn the system key to “On” to activate the innerVision product. Upon power up, the system will go through a warm up procedure. (See the warm up procedure section of this manual). The warm up is complete when the 6th warm up stage is finished and the mA and kV setting are at their normal running settings.

Increasing Emitter Life

Warm-Up Procedure

It is recommended that power is always applied to the innerVision controller. Energizing the innerVision emitter with both the kV and mA preset for their maximum values is *not* recommended

Stages	kV range	mA. range	Time
1	6.5-8.5	.039-.059	3 Min.
2	14-16	.088-.108	3 Min.
3	21.5-23.5	.137-.157	3 Min.
4	29-31	.186-.206	3 Min.
5	36.5-38.5	.235-.255	3 Min.
6	43-45	.290-.300	3 Min.

After the emitter has completed the warm-up procedure, energizing the emitter with both the kV and mA preset for their maximum values is acceptable.

If the emitter is to be used throughout the working day, continuous operation will maintain the emitter at its normal operating temperature and minimize warm-up drift. Frequent on-off cycling of full power, although acceptable, is stressful to the emitter.

Troubleshooting

If the X-ray On indicator light on the remote panel does not illuminate when you power the system up, please check the following:

Check to see if the mA and kV displays show any values. If they do not, please check the power switch on the controller to make sure it is on (see the Controller overview section in this manual). If the switch is on, verify that you have the correct power supplied to the controller.

If the mA and kV displays show values but the X-ray On indicator light is off, make sure the E-stop button on the remote panel is in the run position. Turn the key switch to the “Off” position and then back to the “On” position.

If the X-ray On indicator light is still off, review your safety interlock circuit. First, make sure all access panels are closed. Turn the key switch to the “Off” position and then back to the “On” position.

If the X-ray On indicator light is still not illuminated, please check all the interlock safety cables for damage.

If the X-ray On indicator light is still not illuminated, please contact KMV.

Emitter Repair and Return Procedure

The emitter has an average life of 10,000 hrs. An emitter must be returned to KMV for proper repair and/or replacement. The procedure for preparing the emitter for return and repair is as follows:

1. Place masking tape over the emitter window.
2. Ensure that the emitter is clean and dry.
3. Place the emitter in a plastic bag and seal with tape.
4. Place the emitter in a KMV approved shipping container / box.

Complete the KMV Emitter Return Form and make two copies (see the KMV Emitter Return form).

Place one KMV Emitter Return Form with the packing list and attach to the KMV approved shipping container / box.

Emitter Repair / Return Form

Date _____

Return To: KMV 5065 27th Avenue Rockford, IL 61109 Returned By: _____	<p>Emitter</p> <p>Emitter is being returned for:</p> <p>() For Repair</p> <p>() Disposal</p> <p>() Warranty Repair</p>
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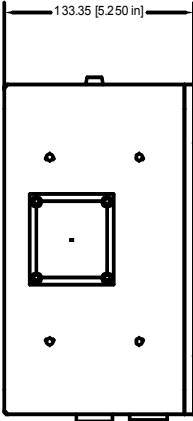
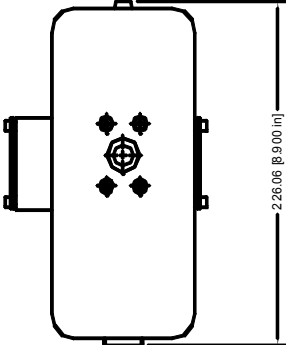
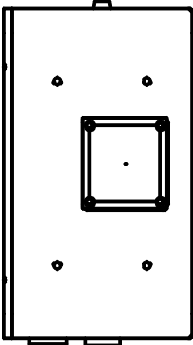
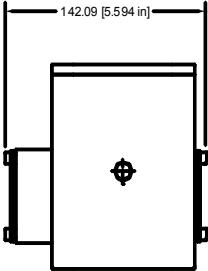
Customer Packing Slip Number _____

Customer Purchase order Number (if warranty repair) _____

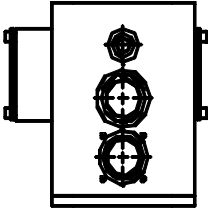
Quantity	Part #	Description

Notice to KMV
 If Warranty Repair, Please Send A Corrective Action Statement
 () With Next Shipment () Within _____ Days

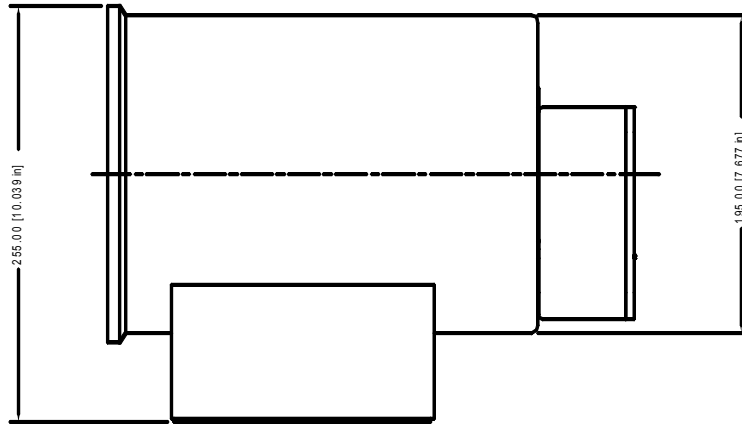
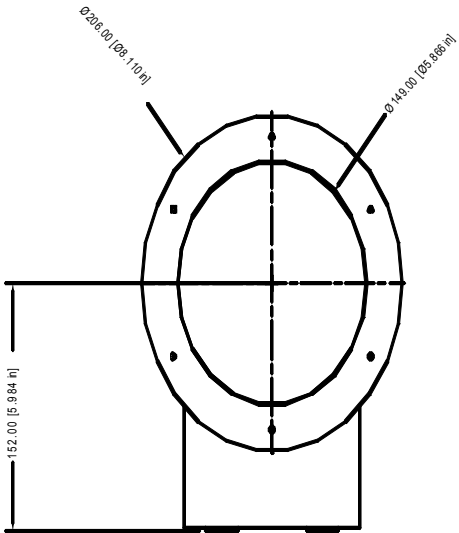
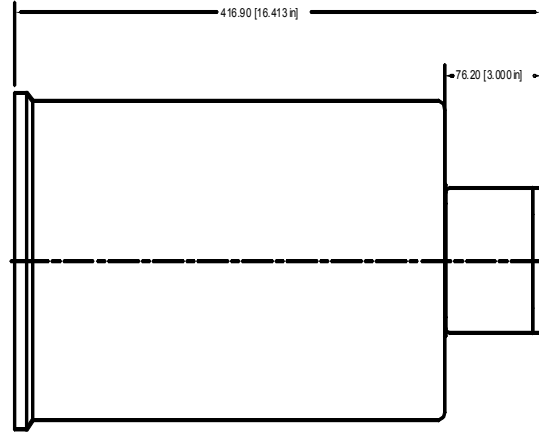
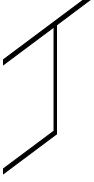
Emitter Dimensions



SCALE 1/2



Lens Assembly Dimensions



SCALE 1/2